NOTES ON GEOGRAPHIC DISTRIBUTION

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Range extension for *Drymoreomys albimaculatus* Percequillo, Weksler & Costa, 2011 (Mammalia, Rodentia, Cricetidae) in Mixed Ombrophilous Forest of southern Brazil with the first occurrence from the state of Paraná

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Abstract

Drymoreomys albimaculatus is a recently-described rodent and an Atlantic Forest endemic. It is rare and has a poorly defined geographic distribution. This article presents the first record of *D. albimaculatus* from Paraná state, Brazil and expands the known range of this species into northeastern Santa Catarina state. Both records are from Mixed Ombrophilous Forest and Semideciduous Seasonal Forest types.

Key words

Distribution; Oryzomyini; Atlantic Forest endemic; first record.

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Introduction

Drymoreomys is a monotypic Atlantic Forest endemic genus of a medium-sized cricetid (head-body 122–139 mm, tail 140–175 mm, body mass 44–64 g). It belongs to the tribe Oryzomyini, one of the most diverse tribes among the Sigmodontinae, within which many more species are predicted to be discovered (Weksler and Percequillo 2011, Machado et al. 2013). The sole species, *Drymoreomys albimaculatus* Percequillo, Weksler & Costa, 2011, can be recognized by the following set of external characters: coat color ranging from orange to pale fawn, brown-gray venter with a conspicuous white patch on the throat and chest, presence of inguinal stains and a long unicolored tail (Percequilloet al. 2011).

This species was described based on specimens collected in 5 small areas of São Paulo state, and 3 from Santa Catarina state, both southern Brazil (Percequilloet al. 2011).The type locality is in Intervales State Park (24°20′01″ S, 048°25′10″ W) at an elevation of 700 m (municipality of Ribeirão Grande, Vale do Ribeira, São Paulo state). The largest collection of available specimens (19 specimens) comes from the Parque Natural Municipal Nascentes do Garcia, now Serra do Itajaí National Park (27°02′12″ S, 049°08′22″ W), at an elevation of 650 m (Percequillo et al. 2011) (municipalities of Indaial and

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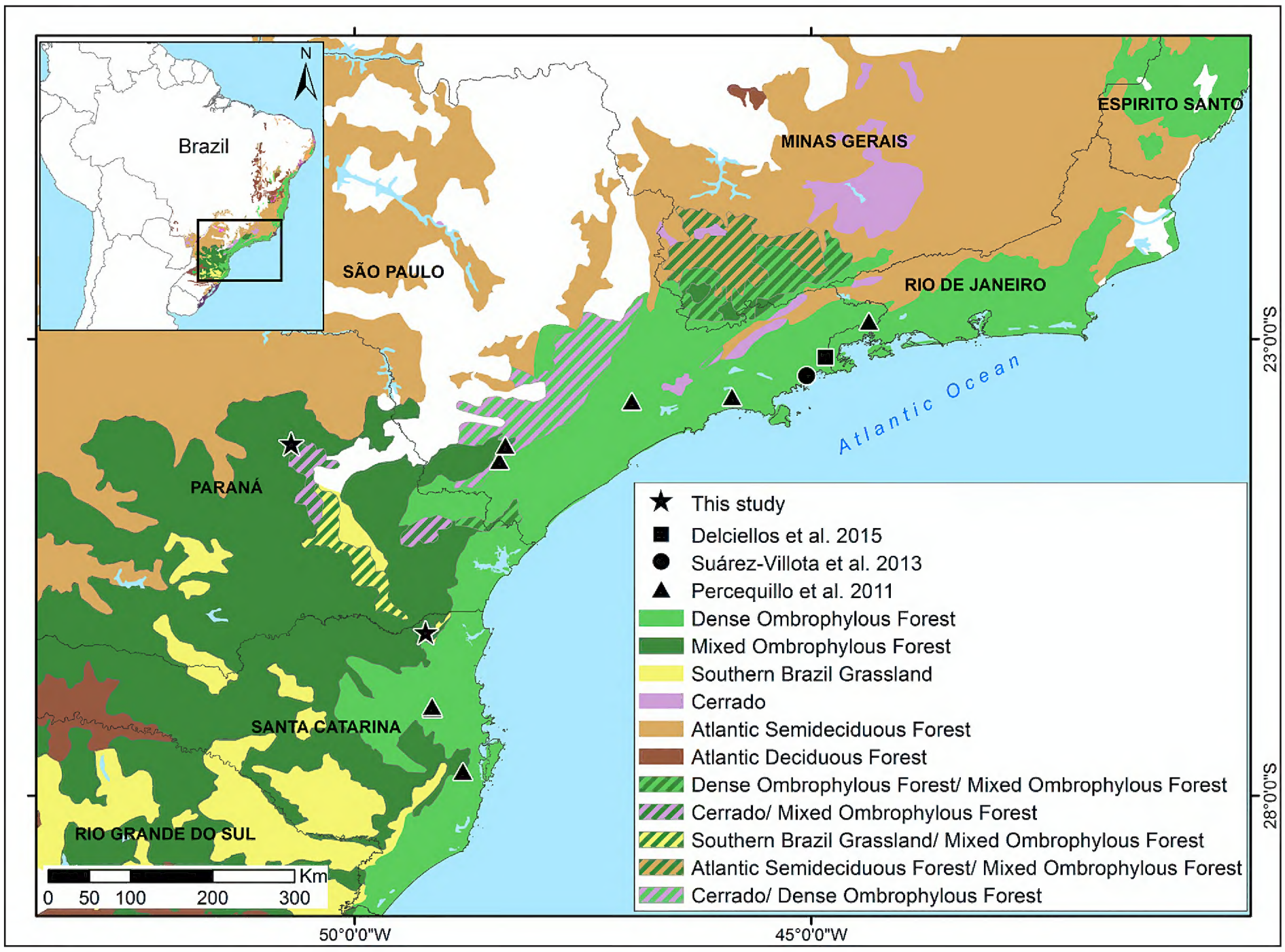

Figure 1. Distribution map of *Drymoreomys albimaculatus* in Brazil, with new occurrences in Santa Catarina and Paraná.

Blumenau, Santa Catarina state) (Fig. 1).

Based on the original description, *D. albimaculatus* has a distribution that is restricted to the Atlantic Forest biome and particularly above 600 m in Montane Dense Ombrophilous Rainforest on the slopes of the Serra do Mar. Because it is a newly discovered species, much remains unknown about it, including its natural history, ecology, limits of geographical distribution, phylogeny, and phylogeography (Patton et al. 2015). However, cytogenetic studies have been undertaken by Suarez-Villota et al. (2013) and Delciellos et al. (2015), as well as taxonomic studies, based on DNA barcoding, by Müller et al. (2013). Herein, we report the presence of *D. albimaculatus* at a new location in the state of Santa Catarina and provide the first record from the state of Paraná

Methods

An important difference is that both sites occurred in Mixed Ombrophilous Forest (with araucaria pine, *Araucaria angustifolia* (Bertol. Kuntze). According to the Köppen–Geiser classification, this biome has a CFA climate, that is, it is humid, mesothermal, and subtropical, with hot summers, mild winters, and no well-defined defined season (Maack 1981, Peel et al. 2007).

In Santa Catarina, 1 specimen was captured in the Environmental Protection Area (APA) Serra Dona Francisca (Fig. 2), a 41,000 ha sustainable use conservation unit, located between the cities of Joinville and Campo Alegre. The collection site (26°12′46.7″ S, 049°13′15″ W) is some 1000 m above sea level, in the areas of Mixed Ombrophilous Forest, where the Montane Mixed Ombrophilous Forest is influenced by open areas of Southern Brazil Grassland. The mean annual temperature is 19 °C, the maximum and minimum recorded tempera-

Figure 2. Young specimen *Drymoreomys albimaculatus* (FURB 18608), captured in Forest area close to the Tibagi River, Telêmaco Borba, Paraná, Brazil.

tures are 34 °C and –7 °C, respectively (Pandolfo et al. 2002). The area has suffered significant anthropogenic change, with pasture now dominant and fragmenting the forest in as small patches accessible to livestock. The specimen was captured on private land, the Fazenda Sequoia, in grazed land in the basin of the Rio Negro, a tributary of the Iguaçu River, one of the major river basins of Paraná. The studies were conducted under license SISBIO/ICMBio no. 35005-3/2013.

The Paraná state collection site is located in a Alluvial Mixed Ombrophilous Forestarea close to the Tibagi River (24°08′47″ S, 050°33′08″ W), one of the main tributaries in the Paranapanema river basin, in the municipality of Telêmaco Borba, in the central northeastern region of the state, at an elevation of 821 m. The site is located in the central section of the Second Paraná Plateau. Mean annual temperatures are between 18–20 °C, with 23–25 °C occurring in the hottest month (February), and 13–15 °C in the coldest (July) (IAPAR 1994). Vegetation at the collection site was dominated by Mixed Ombrophilous Forest and enclaves of Semideciduous Seasonal Forest (IBGE 2012). Now, the entire forest fragment of this municipality is surrounded by a matrix of exotic silvicultural species, such as *Pinus* spp. and *Eucalyptus* spp., in extensive plantations. These are used in local timber, pulp, and paper industries. The single specimen from Paraná was captured near Fazenda Monte Alegre/ Industry Klabin in an alluvial forest area (Authorization for scientific research IAP No. 038/2010).

Results

The specimens were captured at ground level using pitfall traps (60 L buckets). During the study at Telêmaco Borba, the total deployed effort was 17,052 trap nights for 27 months, resulting in the capture of 932 individual small nonvolant mammals (trap success: 5.4%), from other 14 species, *Gracilinanus microtarsus* (Wagner, 1842) (6), *Monodelphis americana* Müller, 1776 (4), *Monodelphis iheringi* (Thomas, 1888) (71), *Monodelphis* cf. *sorex* (Hensel, 1872) (15), *Akodon montensis* Thomas, 1913 (37), *Bibimys labiosus* (Winge, 1887) (9), *Brucepattersonius iheringi* (Thomas, 1896) (98), *Euryoryzomys russatus* (Wagner, 1848) (42), *Juliomys pictipes* Oosgod, 1933 (26), *Necromys lasiurus* (Lund, 1841) (4), *Nectomys squamipes* (Brants, 1827) (1), *Oligoryzomys flavescens* (Waterhouse, 1837) (68), *Oligoryzomys nigripes* (Olfers, 1818) (371) and *Thaptomys nigrita* (Lichtenstein, 1829)(180). This extensive effort resulted in the capture of a single individual of *D. albimaculatus*, confirming the rarity of this species at the study location. We do not have the same level of information for the Santa Catarina specimen because it was caught during a survey for amphibians, and the specimen was given to us by the coordinating researcher.

Both specimens were preserved dry, with the skull removed. The Fazenda Monte Alegre specimen was deposited in the scientific collection of the Fundação Universidade Regional de Blumenau, Blumenau, Santa Catarina, Brazil, as accession number FURB 18608. The Fazenda Sequoia specimen was deposited in the Museu de História Natural Capão da Imbuia, Curitiba, Paraná, Brazil, as accession number MHNCI 6667. Specimens were identified as *D. albimaculatus* from the description in Percequillo et al. (2011), and by comparisons with paratypesin the FURB collection. Measurements of external characters and skull were obtained using digital caliper (0.01 millimeter precision), following Musser et al. (1998).The measurements and external characters of the two captured individuals lay within the range of variation for the holotype and paratypes, in relation to ontogenic stage (Table 1).

Discussion

Externally both have tawny dorsal coloration with basal part grayish. The color of the ventral hairs is grayish with white tips, with distinctive white patches in gular-thoracic

Table 1. External and skull measurements (mm) and body mass (g) of *Drymoreomys albimaculatus*. MZUSP 34714 (holotype, adult; measurements according with Percequillo et al. 2011), FURB 9666 (paratype, young), FURB 18608 (young), and MHNCI 6667 (adult).

Specimen	**Ribeirão Grande/SP MZUSP 34716**	**Indaial/SC FURB 9666**	**Telêmaco Borba/PR FURB 18608**	**Campo Alegre/SC MHNCI 6667**
Sex	♀	♂	♀	♂
Head and body length	149	105	110	—
Tail Length	176	120	125	—
Hind foot length (no claws)	—	22.98	25	20
Hind foot length (with claws)	28	23.8	27	22
Ear length	20	15.5	19	20
Body mass	57	26	25	55
Condylo-incisive length	30.67	24.21	26.19	29.81
Length of diastema	8.56	6.36	6.38	8.37
Length of incisive foramina	6.33	4.96	5.10	5.85
Zygomatic breadth	17.84	13.79	14.06	17.05
Breadth of incisive foramina	2.82	2.16	2.14	2.81
Length of nasals	12.37	10.19	8.75	11.42
Collection day	21.7.1992	17.9.2004	28.7.2011	09.10.2012

Figure 3. *Drymoreomys albimaculatus.* **A.** Young female (FURB 18608), Fazenda Monte Alegre,Telêmaco Borba, Paraná. **B.** Adult male (MHNCI 6667), Serra Dona Francisca, Campo Alegre Santa Catarina, Brazil.

region in specimen FURB 18608 and gular-thoracic and inguinal region in specimen MHNCI 6667, that is characteristic of the species (Fig. 3). Craniometric characters of the individuals agree with those of the holotype: nasals and premaxillary bones projected anteriorly forming a short tube, long and wide incisive foramina, short palate with multiple posterolateral palatal pits recessed in shallow fossae, robust alisphenoid strut (Fig. 4).

The specimen from Serra Dona Francisca expands 93 km from the known range of *D. albimaculatus* into northeastern Santa Catarina. This site, within the municipality of Campo Alegre, is very close to the coast. The second specimen, captured at Fazenda Monte Alegre, is the first record of *D. albimaculatus* from Paraná, extending this species' range 243 km westward from the type locality. This highlights the gaps in faunal inventories for the state (Leite 2014). Based on these new records, an updated map of the geographical distribution of *D. albimaculatus* in Brazil is shown in Figure 1. These new occurrence data shows the importance of increasing sampling efforts in isolated and inland places, even at locations already sampled. The municipality of Telêmaco Borba provides an example, as it has already been subject to much field sampling for mammals (Reis et al. 2005), including small non-volant species (Oliveira et al. 2005, Tiepolo 2007).

The record in Paraná expands the known distribution of *D. albimaculatus* to another southern Brazilian state, and highlights its presence in areas where the vegetation is ecotonal between Mixed Ombrophilous Forest, Montane Dense Ombrophilous Rainforest, and Semideciduous Seasonal Forest. Cheremet al. (2011), Percequillo et al. (2011), Leiner and Silva (2012), and Di-Nizo et al.

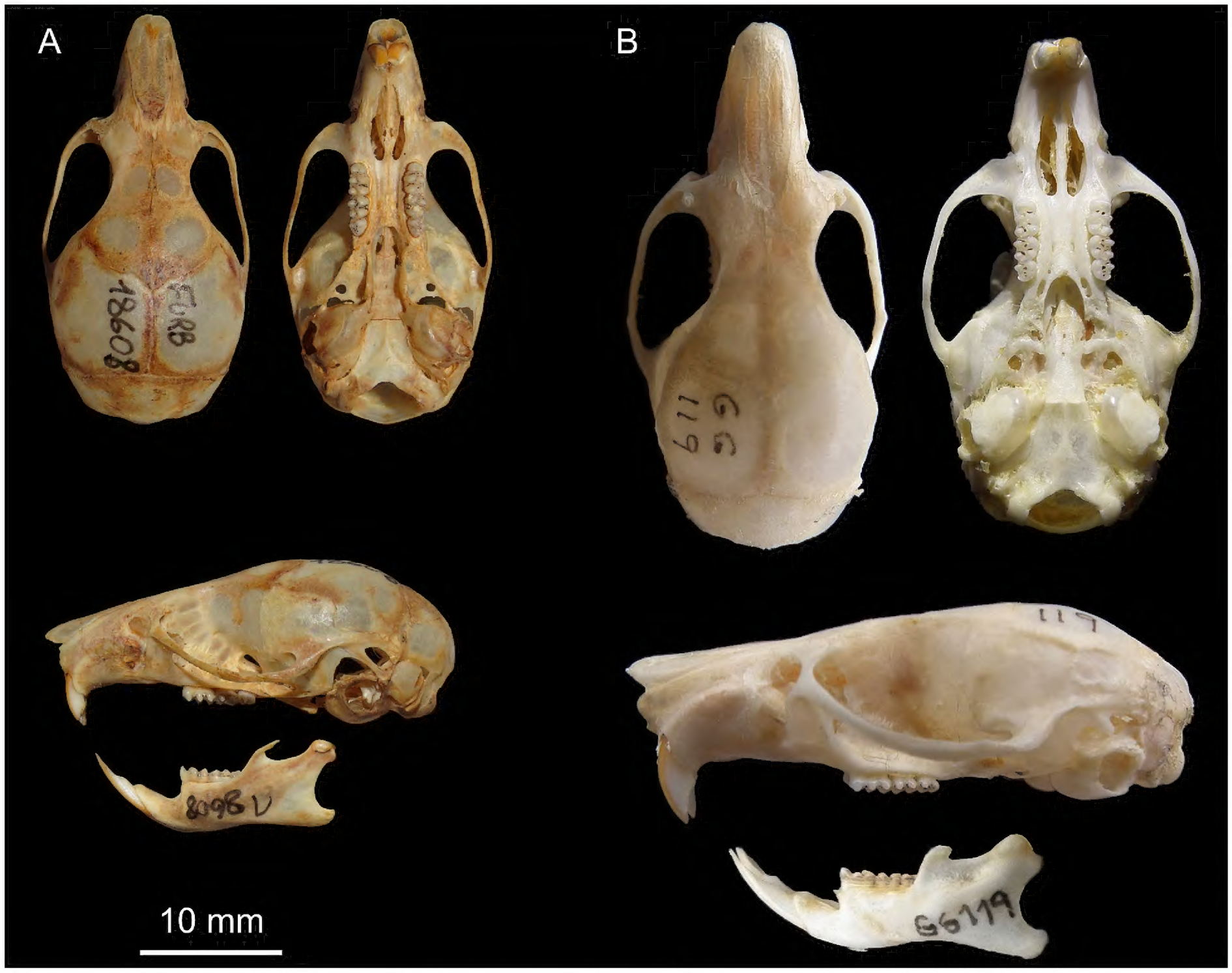

Figure 4. *Drymoreomys albimaculatus,* dorsal, ventral and lateral views of the skulls and jaws. **A.** Young specimen (FURB 18608). **B.** Adult specimen (MHNCI 6667).

(2014) all reported this species exclusively from Dense Ombrophilous Rainforests near the coast, meaning that the new site in Paraná is the furthest from the coastal Atlantic Forest biome of any known occurrence. Our new records show the importance of small mammal inventories in poorly known areas and the scientific utility of fieldwork made for technical consulting purposes when undertaken by professional mammalogists. One of the new records also highlights the value of specimen interchange between researchers and shows how cooperation between individuals studying different taxonomic groups can expand distributional knowledge of little-known.

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Author's Contribution

FJV, JAR and BSBS collected the data and made the photographs. All authors wrote and corrected the text.

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